

April 7, 1964

R. WAGNER
BEATER WHEEL MILL

3,128,052

Filed June 11, 1962

2 Sheets-Sheet 1

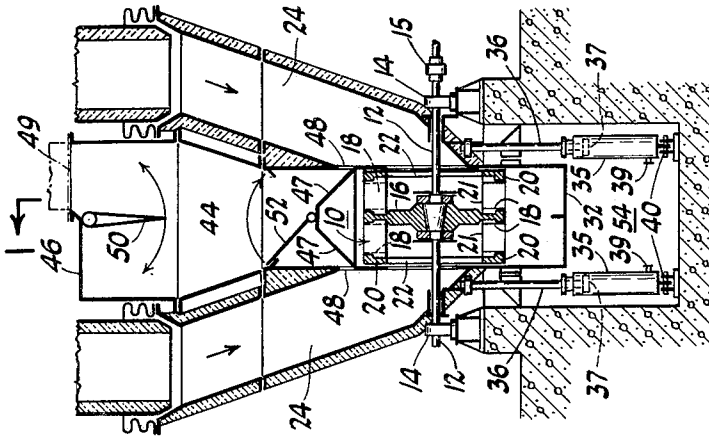


FIG. 2

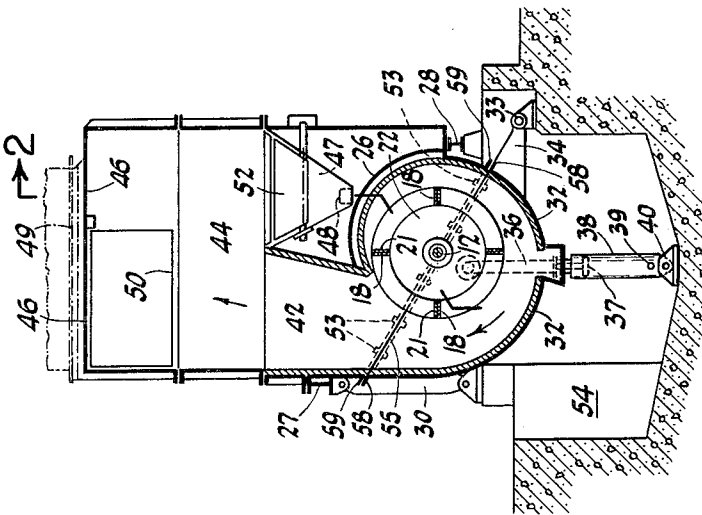


FIG. 1

INVENTOR:
RICHARD WAGNER

BY

Arthur C. Fied

AGENT

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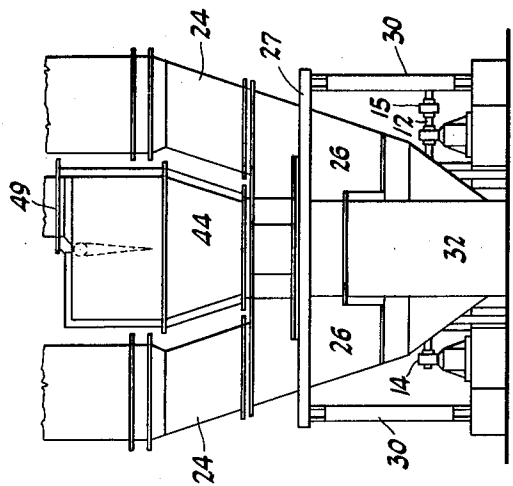


FIG. 4

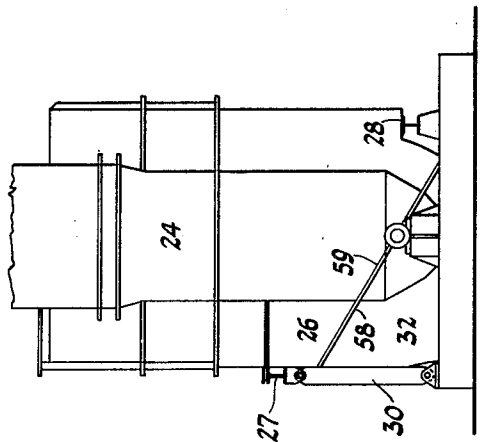


FIG. 3

INVENTOR:
RICHARD WAGNER
BY *Arthur C. Fiel*
AGENT

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3,128,052

BEATER WHEEL MILL

Richard Wagner, Vienna, Austria, assignor to Kohlen-scheidungs-Gesellschaft, m.b.H., a corporation of Germany

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7 Claims. (Cl. 241—55)

The invention relates to a beater wheel mill of the kind in which the beater wheel has a shaft journaled at both ends, axially receives material and carrier gas from both sides, and in which the material is pulverized by impact with the beater plates and the mill housing surrounding the beater wheel. More specifically, the invention relates to a mill of the above type as it is being employed in pulverizing coal for use in coal fired steam generators.

The operating availability of these mills exerts a great influence upon the economy of the mill and on that of the furnace and steam boiler which it serves. Such availability is reduced by the length of time that is required when taking the mill out of service for the purpose of replacing worn parts such as the beaters of the mill. The economy of the steam boiler and power plant is further reduced by the cost of labor that must be employed to perform these services. In addition, the acquisition of a mill of this type in a given power plant may hinge on the additional floor space that must be available for replacing worn portions of the mill, since such additional floor space necessary for retraction of parts of the mill is usually at a premium in power plants.

The invention provides, to a much greater degree than is possible with mills of conventional design, for the attainment of the objects set forth hereinabove, i.e., the speedy and easy replacement of worn parts, and minimum floor space requirements for accomplishing such replacements.

To attain these objects the mill housing is subdivided along a line or imaginary sectional surface preferably parallel to the beater wheel axis, into an upper portion and a lower portion, with the upper portion of the mill housing being supported independently of the lower mill housing, and with a cavity or pit being provided below the lower housing into which the lower housing can partially or totally be submerged. In order to conveniently replace the beaters, the lower portion of the mill housing can now completely be moved downwardly and away from the beater wheel, while the upper portion of the mill housing remains fixed and permanently connected to the various ducts that conduct the material and carrier gas to and from the mill.

Provision of additional floor space for storing the lower mill housing is accordingly not required. Furthermore, easy access is obtained by the maintenance crew through the wide opening provided when needed between the upper and lower portion of the mill housing for replacing beater plates or other worn parts of the mill.

In accordance with the invention the division of the housing preferably occurs along a slanted sectional surface which may pass directly above and parallel to the beater wheel axis. Furthermore the invention provides that the uppermost portion of the dividing sectional surface intersect the front of the mill housing along a line which is located above the projected top or rim of the beater wheel when installed in the mill.

Further, in accordance with the invention, a stationary and preferably hydraulic lifting, lowering and supporting device is provided for lowering or raising the lower mill housing with respect to the upper mill housing, with the housing hingedly supported at one end for easy lowering into the pit.

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Other objects and advantages of the invention will become apparent from the following description of an illustrative embodiment of the invention when taken in conjunction with the accompanying drawings wherein:

FIG. 1 is a vertical sectional side elevation of the mill approximately along line 1—1 of FIG. 3 and incorporating the improvements disclosed by the invention;

FIG. 2 is a vertical sectional front elevation approximately along line 2—2 of FIG. 1;

FIG. 3 is a side elevation of the improved mill organization; and

FIG. 4 is a front elevation of the improved mill organization.

The mill comprises a beater wheel 10 having shaft 12 rotatably supported in two journals 14 and driven by a motor or other means (not shown) by way of coupling 15. The beater wheel 10 comprises a hub disc 16 which by means of cross pieces or braces 18 is connected on both sides in spaced relation with rings discs 20. In this manner a double acting beater wheel is formed which induces material flow from both sides into the wheel. The beater plates 21, which must be replaced from time to time, are in well known manner radially supported on plates 18 between discs 16 and 20. Central openings 22 are provided in ring discs 20 to permit entry of the coal and carrier gas into beater wheel 16, such coal being discharged by way of the outlets of coal chutes 24 arranged on both sides of the beater wheel. An upper housing 26 partially surrounds beater wheel 16, with the housing 26 being supported on structural members 27 and 28. The member 28 is rigidly supported while the member 27 rests on rocking posts 30 to permit thermal expansion of the upper housing. The lower portion of the beater wheel 16 is surrounded by the lower housing 32 which is rotatably hinged in bearings 33 by means of brackets 34. The lower housing 32 rests additionally on posts 36 which are provided with pistons 37 slidably engaging cylinders 38 for raising or lowering of lower housing 32 by the action of a pressurized fluid being introduced into cylinders 38, such as water or oil, for instance. Such fluid enters the cylinders by way of inlet 39, from a suitable source not shown. Cylinders 38 are rotatably supported in bearings 40. The upper and lower housing forms a vortex shaped casing surrounding beater wheel 16, with an outlet duct 42 being provided and extending from the upper housing 26 for discharge of pulverized coal and carrier gas into a plenum chamber 44.

During operation the pulverized coal egressing from outlet duct 42 is hurled against plate 46 forming part of the roof of chamber 44 and is deflected therefrom, with the heavier particles falling into one of a pair of troughs 47 to be returned for regrinding to the inlet of the beater wheel by way of return outlets 48. The lighter coal particles are entrained in the gas stream and carried through outlet 49 to a point of use such as the burners of a steam power plant. A damper 50 is provided adjacent outlet 49 to act in controllably blocking outlet opening 49 and also in controllably deflecting the heavier particles back into the mill. A second damper 52 serves the purpose of directing the rejected material either to the right side or to the left side of the beater wheel or to both sides in desired proportions.

During operation of the steam power plant it becomes frequently necessary to obtain access to the beater wheel or other portions of the mill for the purpose of inspection or replacement of parts or removal of the beater wheel. Such access can, in accordance with the invention, easily be obtained by lowering the lower portion 32 of the mill housing into a recess or pit 54 provided for this purpose. This is easily and speedily accomplished by removing bolts or clamps 53 securing the lower housing to the upper housing and releasing the pressurized fluid contained in

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cylinders 38 thereby lowering the lower mill housing 32 a desired amount, while the housing is hingedly supported at 33. Because, in accordance with the invention, the sectional surface 55 dividing the upper and lower housing is slanted or formed in such a manner that the upper edge 56 thereof lies above the top of the beater wheel 16, the wheel can readily be removed without disturbing the upper mill housing 26 to which the mill inlet ducts 24 and mill outlet ducts 42, 44 are attached. After the necessary repair work has been performed on the mill, pressurized fluid is again introduced into cylinders 38, lifting pistons 37 and thereby placing the lower housing in a juxtaposed position with the upper housing. Bolts or clamps 53 are then again made use of to secure the circumferential flange 58 of the lower housing to the corresponding flange 59 of the upper housing, so as to obtain a connection that resists leakage of coal dust and gas from the mill into the boiler room.

From the aforesaid it can readily be appreciated that my invention contributes in a novel manner and to a substantial degree to improving the economy of beater mill operation. Such improved economy results from a saving in time required by the maintenance crew for inspecting the working parts of the mill, for replacing worn parts or for removing and replacing the beater wheel if more extensive repairs are required. Such shortening of the time for maintenance accomplishes an increase in plant availability, and therefore a lower cost and greater efficiency in operating the power plant. It results in a reduction of labor cost in maintaining the mill in good operating condition, and it accomplishes an extension of the useful life of the mill by making more frequent inspections possible, because of lower costs and shorter time required in obtaining access to the mill. The invention also by virtue of the pit 54, permits removal of the beater wheel without requiring more floor space in the vicinity of the mill than would usually be required for operating the mill.

I have shown and described hereinabove a preferred embodiment of the invention for achieving the desired results, including for instance, a hydraulic lifting device 37, 38. However, it is to be understood that my invention can with equal beneficial results be practiced by employing other conventional and equivalent means such as, for instance, a mechanical lifting device or an electrically driven device. Therefore, the hereindescribed and illustrated embodiment of my invention is merely illustrative and not restrictive and variations and modifications may be made therein without departing from the spirit and scope of the invention. I, therefore, do not wish to be limited to the precise details set forth, but desire to avail myself of such changes as fall within the purview of my invention.

I claim:

1. A beater wheel mill organization for pulverizing material, having a beater wheel axially supported on a horizontal shaft for rotation within a vertical housing, an opening for receiving material and carrier gas axially of the wheel, and an opening for discharging tangentially of the wheel said pulverized material from said housing,

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the combination of means for dividing said housing into an upper portion and a beater wheel, means for supporting said upper portion independently of said lower portion, means for supporting and lowering said lower portion downwardly and away from said upper portion, and cavity forming means provided below said lower portion and said wheel for submerging therein at least a major part of said lower housing portion when access to said mill is needed for removal of said wheel in horizontal direction and perpendicular to said horizontal shaft.

2. A beater wheel mill in accordance with claim 1 wherein said housing is divided along a sectional surface such as to permit removal of said wheel unhindered by said upper and lower housing after lowering of said lower housing into said cavity.

3. A beater wheel mill in accordance with claim 1 wherein said means for supporting and lowering said lower housing into said cavity comprise hydraulic cylinder and piston means.

4. A beater wheel mill in accordance with claim 1 wherein said lower housing is hingedly supported on one end for swinging said housing downwardly into said cavity.

5. In a beater wheel mill organization for grinding material and having a beater wheel mounted for rotation on a horizontal shaft, a mill housing surrounding said wheel, said wheel having an opening for receiving material and carrier gas axially of said wheel, said housing having an opening for discharging said ground material from said housing and tangentially of said wheel, and means for dividing said housing into an upper portion and a lower portion, the improvement comprising the combination of first means for supporting said upper housing portion independently from said lower housing portion, second means for supporting said horizontal shaft and beater wheel independently of said lower housing portion, means forming a cavity below said lower housing portion for receiving said lower housing portion, and third means for supporting said lower housing portion in normal operating position, said third supporting means also being operative for lowering said housing portion into said cavity, whereby the beater wheel becomes accessible for inspection, repair, replacement of parts or for entire removal of the beater wheel in a horizontal direction and normal to said shaft.

6. A beater wheel mill in accordance with claim 5 wherein said means for lowering said lower housing into said cavity comprises hydraulic cylinder and piston means.

7. A beater wheel mill in accordance with claim 5 wherein said lower housing is hingedly supported on one end for swinging said housing downwardly into said cavity.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,128,052

April 7, 1964

Richard Wagner

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 2, line 19, for "rings" read -- ring --; column 4, line 2, for "beater wheel" read -- lower portion --; line 3, for "upper portion" read -- beater wheel --; line 41, for "said housing" read -- said lower housing --.

Signed and sealed this 13th day of October 1964.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents